

Midterm Review 1

- 1) The average height in centimeters of US children from ages 7 to 15 is given in the table below. Use this information to answer the questions below.

Age (years)	7	8	9	10	11	12	13	14	15
Height (cm)	119.3	127.0	132.0	137.1	142.2	147.3	152.4	157.5	162.2

- Which variable should be the independent and which the dependent?
 - What is a reasonable domain and range for this situation?
 - Find the best-fit line for the data.
 - Give the real-world meaning for the slope and y-intercept.
 - Discuss the correlation coefficient.
 - Use your best-fit line to find the height of a newborn and a 40-year-old.
How do your values compare with the actual length of a newborn ($\approx 50\text{cm}$) and a 40-year-old? (1 inch = 2.54cm)
- 2) With a 20 mph wind there is a decrease in the perceived temperature of the air. At a temperature of 15°F , the approximate wind-chill temperature is -17°F . At a temperature of 30°F , the approximate wind-chill temperature is 4°F .
- If this is a linear relationship, write an equation to model the situation.
 - Give a real-world meaning for slope, y-intercept, and x-intercept.
 - What is the wind-chill temperature if the actual temperature drops to -14°F ?
 - What actual temperature will give a wind-chill temperature of 53°F ?
- 3) Solve the following system of equations algebraically using elimination AND using matrices.
- $$\begin{aligned}2x + y - z &= 5 \\3x - y + 2z &= -1 \\x - y - z &= 0\end{aligned}$$
- 4) A certain diet requires a least 60 units of carbohydrates, 45 units of protein, and 30 units of fat each day. Each ounce of Supplement A provides 5 units of carbohydrates, 3 units of protein, and 4 units of fat. Each ounce of Supplement B provides 2 units of carbohydrates, 2 units of protein, and 1 unit of fat. If Supplement A costs \$1.50 per ounce and Supplement B costs \$1.00 per ounce, how many ounces of each supplement should be taken daily to minimize the cost of the diet?

- 5) Use a matrix equation to solve the problem below. Be sure to show the setup of the equation along with the steps to solve it.

You can buy 1 lb. of almonds, 1 lb. of pecans, and 1 lb. of pistachios for \$13.

You can buy 2 lbs. of almonds and 3 lbs. of pecans for \$15.50.

And you can buy 3 lbs. of pecans and 2 lbs. of pistachios for \$24.

Find the price per pound of each kind of nut.

- 6) Solve each equation or inequality. For every inequality, sketch a graph with your solution.
- a) $-6(2x - 10) + 12x \leq 180$
 - b) $3|4x - 1| - 5 = 10$
 - c) $|2x - 4| + 16 \leq 24$
- 7) A seven-member school oversight committee is to be formed having one administrator, three teachers, two students, and one parent. There are four administrators, ten teachers, fifteen students, and 5 parents in contention for the committee. How many seven-member committees are possible? If the committee is chosen at random, what is the probability that a committee will be chosen that includes the principal?
- 8) In the original game of poker known as “straight” poker, a five-card hand is dealt from a standard deck of 52 cards.
- a) How many different straight poker hands are possible?
 - b) What is the probability that a hand will contain a least one king?
- 9) Find the inverse of matrix A by hand. Show all your work.

$$A = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}$$

Answers Midterm Review 1 '1011 – Algebra 2:

1)

- a. Independent: x-variable; Dependent: y-variable
- b. Domain (7, 15) Range (119.3, 162.2)
- c. $y = 5.235x + 84.304$
- d. Slope is 5.0833 and it means that between the ages of 7 and 15 the average child grows 5.0833 cm per year. The y-intercept is 86.31667 and in the context of this problem, this would be the height in cm of a newborn.
- e. The Correlation Coefficient is $r = 0.9986$ which means that there is a very high correlation between the age and height of children between the ages of 7 and 15.
- f. According to the model, a newborn would be 84.304cm and a 40-year-old would be 293.7cm. These heights are both unrealistic because average growth for children under 7 is faster than 5cm per year and the typical person does not continue to grow until 40.

2)

- a) $y = 1.4x - 38$ or $y = 1.4(x - 15) - 17$ or $y = 1.4(x - 30) + 4$
- b) Slope, the perceived temp drops 1.4°F for every drop of 1°F in actual temperature. The y-intercept is the wind-chill at 0°F . The x-intercept is the actual temperature at which the perceived temperature is 0°F .
- c) $y = -57.6^{\circ}\text{F}$
- d) $x = 65^{\circ}\text{F}$

3) $x = 1, y = 2, z = -1$

4) 7.5 ounces of A and 11.25 ounces of B **OR** 15 ounces of A and none of B. Is one a better deal?

5) Almonds = \$2.50, Pecans = \$3.50, Pistachios = \$7.00

6) a) All Real Numbers b) $x = -1$ and 1.5 c) $-2 \leq x \leq 6$

7) ${}_4C_1 * {}_{10}C_3 * {}_{15}C_2 * {}_5C_1 = 252,000$. Think about this one in terms of groups. Out of the admin. Group we need to choose 1, out of the teacher group we need 3, etc. The probability of getting a group with the principal is $\frac{1}{4}$ because there are four administrators and the principal is one out of these four.

8) a. ${}_{52}C_5 = 2,598,960$

- b. Find the probability of getting 1 King, then find it for 2 Kings, then find it for 3 Kings, and lastly for 4 Kings. Then add these probabilities together to get the answer to this problem, $\approx 34.1\%$. To find the probability of 1 King we can think of this as two groups, a group of Kings and a group of non-Kings. For the group of Kings we have ${}_4C_1$ because there are 4 Kings and we want one of them. For the group of non-Kings we have ${}_{48}C_4$ because there are 48 cards that are not Kings and we need 4 of them to make a 5-card hand. Follow the same pattern for the other situations. Then take the total and divide by all possible hands.

$${}_4C_1 * {}_{48}C_4 + {}_4C_2 * {}_{48}C_3 + {}_4C_3 * {}_{48}C_2 + {}_4C_4 * {}_{48}C_1 = 886,656 \text{ then } / 2,598,960 = 34.1\%.$$

9)

$$\begin{bmatrix} 1.5 & -0.5 \\ -2 & 1 \end{bmatrix}$$